Pain Prevalence Among Children Visiting Pediatric Emergency Departments

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Objectives: The main purpose of this study was to investigate the prevalence, characteristics, and intensity of children's pain in emergency departments. The secondary purpose was to evaluate the interobserver agreement regarding the level of pain perceived by professionals, parents, and children.

Methods: This was a multicenter, survey-based research study on 0- to 18-year-old patients visiting 1 of the 15 hospitals that form part of the Working Group on Analgesia and Sedation of the Spanish Society of Pediatric Emergency Medicine between October and December 2018. The surveys recorded pain presence, intensity, characteristics, and location.

Results: The study included 1216 surveys. At the time of the interview, 646 patients were experiencing pain, a prevalence of 53.1% (95% confidence interval, 50.3%–55.9%), with 25.38% reporting mild, 36.68% moderate, and 37.46% intense pain. Among the patients, 29.9% had abdominal pain and 14.1% pain in their legs.

The pain lasted less than 24 hours in 48.2% of the patients, whereas only 3.0% experienced pain during more than 15 days. The parents of 50.7% of the children had provided an analgesic at home.

Interrater agreement regarding pain levels was $k = 0.35$ between professionals and children, $k = 0.38$ between children and parents, and $k = 0.17$ between parents and professionals. For children unable to cooperate, the agreement between professional/child and the parents was $k = 0.11$.

Conclusions: Pain is a common symptom among emergency department patients, and its evaluation should therefore be obligatory. We found low interrater agreement on pain levels between patients, professionals, and parents, which confirms how difficult it is to accurately evaluate pain intensity.

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Pain, according to the International Association for the Study of Pain, is an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage.[1] This definition seems insufficient when dealing with pediatric patients or individuals incapable of verbalizing their pain who may have no prior experience with injuries. Therefore, one of the definitions that is best adapted to this population is that it is a multifactorial personal experience with physiological, behavioral, emotional, developmental, and sociocultural components that can all lead to a different perception of pain.[2,3]

Pain is a frequent reason for emergency department visits, whether directly or indirectly due to the pathology causing it.[4] It has a high prevalence among the general population and a huge individual, family, labor, social, and economic impact.[5]

Evaluating and treating pain are essential in the care of pediatric patients. Treating pain should be an integral part of patient care, since it affects not only their satisfaction and well-being but also the course of the underlying pathology.[6] Previous publications have demonstrated that untreated pain can have negative emotional effects and that it can also negatively affect the clinical evolution of an illness.[7]

According to previous studies, half of all visits to the accident and emergency (A&E) department are due to painful situations.[8–10] However, even though pain is a frequent symptom in emergency departments, numerous studies have proven it to be inadequately identified and managed.[4,10]

Pain should be recognized and treated early on by health care professionals at the emergency department.[10] For this, the first step is to identify its presence, as well as to evaluate its intensity using scales adapted to the patient's age and cognitive status.[4]

Pain scales have been traditionally classified according to the methods they use to evaluate pain intensity, such as self-assessment scales, behavioral scales, and physiological scales.[11] Self-assessment scales are the criterion standard, given that pain is a subjective feeling. However, they cannot be used in preverbal children,[11] so the role of the parents and the health care personnel that treats these patients becomes very important indeed.[11,12] This also makes it necessary to evaluate the consistency between the pain measurement as reported by the child and the evaluation from both the professionals and the parents themselves.

The main objective of our study was to ascertain the prevalence of pain in children who visit the pediatric accident and emergency department, along with its intensity and characteristics in those reported as experiencing it.

As a secondary objective, we sought to evaluate the level of agreement between the pain intensity reported by the children themselves and that perceived by the professionals and parents.

METHODS

Type of Study

A multicenter study using cross-sectional surveys was designed and carried out at 15 pediatric A&E departments from October to December 2018, inclusive.

The study was approved by the local research ethics committee at each participating center and was carried out in accordance with the Declaration of Helsinki.

Study Population and Location

The patients under study were those from 0 to 18 years old who visited 1 of the 15 pediatric A&E departments associated with the Working Group on Analgesia and Sedation of the Spanish Society of Pediatric Emergency Medicine.

Written informed consent was obtained from all participants.

This study was performed in Spain, a country with an area of 505,990 km^2 and with a census range of 47,332,614 people. The 15 emergency departments that participated in the study are distributed across the country; the range of annual visits to their emergency department and their location can be seen in Figure 1.

Sample Selection

Patients from 0 to 18 years old who visited the accident and emergency department for any reason during the study period were included.

Those with a major language barrier (one that hampered their understanding of the informed consent form), unaccompanied minors, and those whose guardians refused to sign the informed consent form were excluded.

The sample was selected using a systematic sampling technique during the morning, evening, and night shifts: the first 2 patients to visit the emergency department from 10:00 AM onward, the first 2 patients after 6:00 PM, and the first patient from 11:00 PM onward were selected as participants.

Estimations revealed that a sample size of 1281 patients was needed; this was calculated using an A&E department pain prevalence of 50% as a reference to define our main objective with a precision of 3% and a confidence interval of 95%, assuming a loss to follow-up of 20%.

Study Variables

Demographic variables for the child (sex, age, country of birth, underlying chronic disease, surgical history, school attendance, participation in extracurricular sports activities, and reason for visit) and for the parents (country of birth, presence of chronic disease) were collected.

Main outcomes:

- Presence of pain: The presence or absence of pain was evaluated in children willing and able to cooperate by asking the child whether they had pain at that moment or not. In preverbal children, the face, legs, activity, cry, consolability (FLACC) observational scale was used, so any score different from 0 was recorded as the presence of pain.[13]
- Intensity of pain: In those patients with pain, the intensity was evaluated using validated scales that were adapted to the child's age and ability to collaborate. The same scales were used in all the participating centers.

In preverbal or noncooperative children, the FLACC observational scale was used[13,14] (0, no pain; 1–3, mild pain; 4–6, moderate pain; 7–10, intense pain). In verbal and cooperative children aged 3 to 7 years, the Wong-Baker Faces Pain Rating Scale was used,[15] which correlates each face with a number from 0 to 10 (0, no pain; 2, mild pain; 4–6, moderate pain; 8–10, intense pain). In children older than 8 years, a verbal numerical scale (VAS) was used (0, no pain; 1–3, mild pain; 4–6, moderate pain; 7–10, intense pain).[16]

We selected these scales because they are validated for measure of acute pain in the emergency department and because all participating medical centers use these scales, and therefore, they are trained in their use.

- Characteristics of the pain: This recorded the location, duration, quality, and whether pain medication had been administered at home.

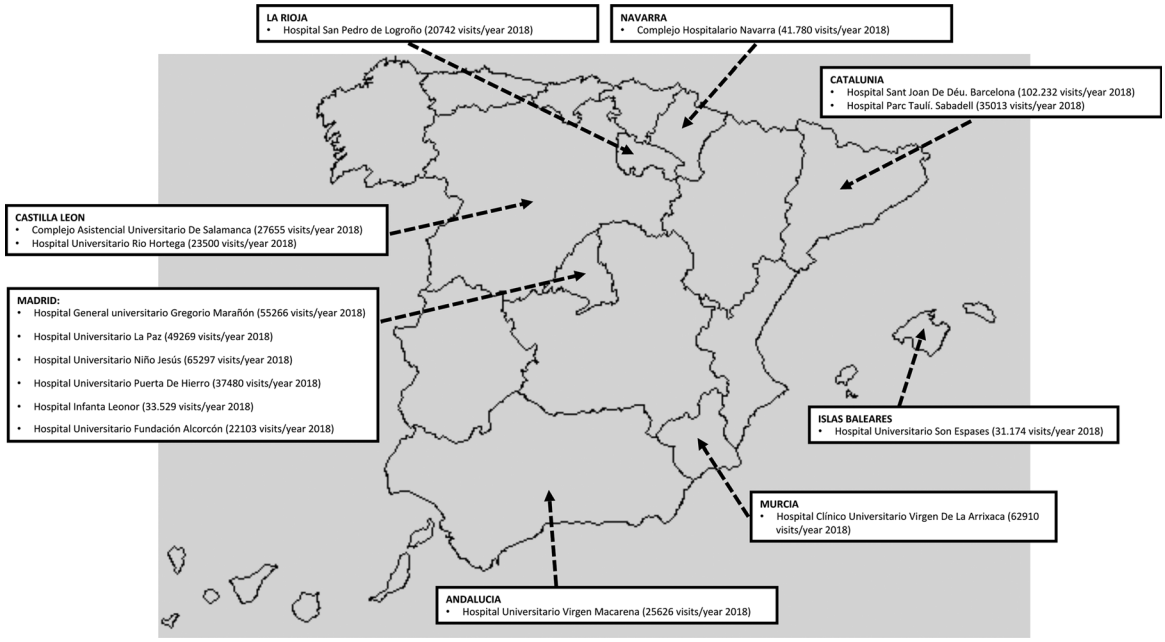

FIGURE 1. Geographic distribution of participating hospitals.

– Location: The location where the patient feels the pain. This was reported by the patient when he/she was able to report it.
– Origin of pain: This refers to the etiopathogenic origin of the patient's pain, and it was coded by the investigator (nociceptive: somatic or visceral; neuropathic, psychogenic, mixed, or not defined). This was reported by the research assistant.
– Duration of pain: Less than 24 hours, 24 to 72 hours, 3 to 7 days, 8 to 15 days, 16 to 30 days, more than 1 month, or always. This was reported by the patient when he/she was able to report it.
– Quality: Pain quality description was performed by giving the participating children a list of descriptors to choose from according to the pain that they were feeling. The list was the following: stabbing, burning or stinging, squeezing (oppressive), cramp-like, other. This was coded by the investigator and reported by the patient when she/he was able to report it.

Secondary outcomes:

– The pain level reported by the parents was measured using the 0 to 10 numerical scale[16] (0, no pain; 1–3, mild pain; 4–6, moderate pain; 7–10, intense pain). The professionals used the FLACC observational scale[13] to evaluate it (0, no pain; 1–3, mild pain; 4–6, moderate pain; 7–10, intense pain). The pain reported by children was measured as described previously in the "intensity of pain" section of the main outcomes.

Data Collection

A case report form (CRF) was filled out for each participating patient. Each center codified their CRFs with an alphanumeric code to ensure patient confidentiality.

This study did not affect normal clinical operations, and the data were handled anonymously.

A digital database was created on the Google Drive platform; this was safeguarded by the principal investigator, who was the only one able to access it in its entirety. The CRFs were sent electronically via this platform, and the principal investigator periodically reviewed the database for quality assurance purposes, seeking to detect any inconsistencies.

Definitions

Origin of the pain: This refers to the etiopathogenic origin of the patient's pain. It is based on where the pain originates from and is defined by the health care professional.

- Neuropathic pain: pain triggered or caused by an injury or primary dysfunction of the nervous system
- Somatic nociceptive pain: that which originates from damage to or stimulus of the nociceptors located in the skin, mucous membranes, muscles, bones, joints, ligaments, tendons, blood vessels, or fascia
- Visceral nociceptive pain: that which originates from damage to or stimulus of the nociceptors located in the viscera or organs
- Mixed pain: pain produced by a combination of neuropathic and nociceptive pain
- Psychogenic pain: that which is not due to the stimulation of a nociceptor or neuronal alteration, but which rather has a mental cause or is the result of a disproportionate intensification of organic pain due to psychological factors

Countries of birth: To optimize their analysis, the different countries are grouped by regions using the World Health Organization classification. This divides countries into 6 regions: Europe, Americas, West Pacific, Africa, Southeast Asia, and the Eastern Mediterranean.[17]

Reason for visit:

- Illness: any consultation that was not associated with direct or indirect trauma was classified as an illness
- Traumatic pathology: a reason for consultation that involved direct or indirect trauma, with or without an associated injury

Chronic disease: long-term illnesses that generally progress slowly, with a duration longer than 6 months

Statistical Methods

The SPSS Statistics software package, version 21, was used to process and analyze data.

The categorical variables were expressed as absolute frequency and percentage, and the qualitative variables with an asymmetric distribution were described using median and interquartile range. The symmetry of the variables was established through a graphical exploration.

The association between qualitative variables was determined using the χ^2 test, whereas, for quantitative variables, this was done using the Mann-Whitney U test. To independently evaluate the

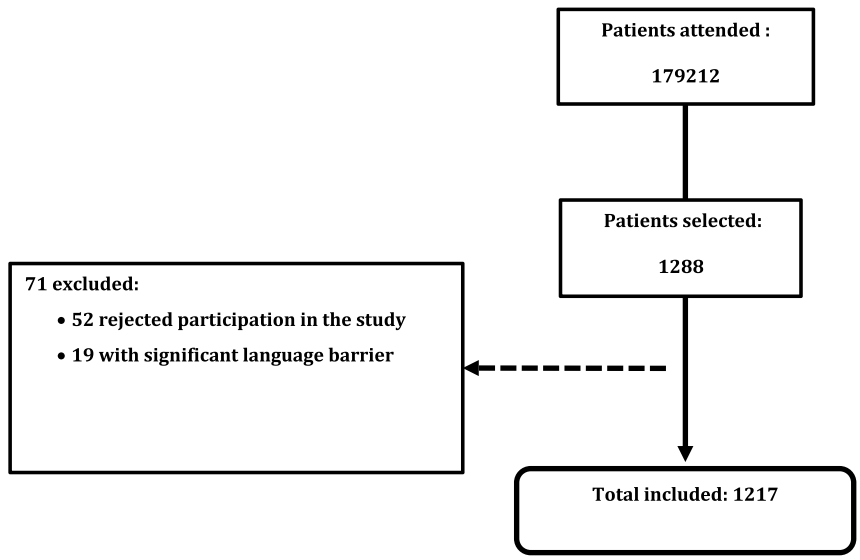

FIGURE 2. Flow chart.

TABLE 1. Intensity and Characteristics of Patients With Pain

	n (%)
Pain intensity	
No pain	571 (46.9)
In pain	646 (53.1)
Mild	164 (25.5)
Moderate	237 (36.7)
Intense	242 (37.5)
Not recorded	3 (0.5)
Type	
Squeezing	201 (31.1)
Sharp	178 (27.6)
Burning	32 (55.0)
Cramping	31 (4.8)
Not identified/not recorded	204 (31.6)
Pain location	
Not willing or able to cooperate/not recorded	34 (5.3)
Abdominal	184 (28.5)
Lower limb	90 (13.9)
Headache	82 (12.7)
Upper limb	63 (9.8)
Aural	48 (7.4)
Facial/dental/oral	48 (7.4)
Throat	38 (5.9)
Back	16 (2.5)
Genital	15 (2.3)
Thoracic	13 (2.0)
Neck	12 (1.9)
Generalized	3 (0.5%)
Probable origin of the pain	
Somatic	376 (58.3)
Visceral	173 (27.0)
Neuropathic	0 (0.0)
Psychogenic	2 (0.3)
Mixed	13 (2.0)
Does not know/no answer	81 (12.9)
Progression time	
<24 h	286 (44.3)
24–72 h	171 (26.5)
3–7 d	77 (11.9)
7–15 d	39 (6.0)
15–30 d	6 (0.9)
> 1 mo	12 (1.9)
Always	2 (0.3)
Not recorded	53 (8.2)
Pain reliever administered at home in past 24 hours	
No	316 (48.9)
Yes	325 (50.3)
Not recorded	5 (0.8)
Pharmaceutical administered at home*	
Ibuprofen	189 (59.8)
Paracetamol	104 (32.9)
Metamizole	13 (4.1)
Topical analgesia	4 (1.3)
Dexketoprofen	3 (1.0)
Tramadol	1 (0.3)
Sumatriptan	1 (0.3)
Not recorded	1 (0.3)

The values are expressed as absolute number (n) and percentage (%).

*Median time since administration, 4 hours (interquartile range, 2–8 hours).

association between the different demographic variables and the presence of pain, we used a multivariate analysis with backward stepwise regression, starting with those variables that demonstrated a significant association in the univariate analysis.

The interrater agreement (between observers) was measured using Cohen κ.[18] It was considered poor when $k < 0.20$, weak when $0.21 < k < 0.40$, moderate when $0.41 < k < 0.60$, substantial when $0.61 < k < 0.80$, and almost perfect when $0.81 < k < 1.00$.

The value for statistical significance was set at $P < 0.05$.

RESULTS

A total of 1288 individuals were originally selected, of which 71 were excluded (52 declined to participate in the study, and 19 had a major language barrier), so 1217 patients were included in the end (Fig. 2).

Characteristics of the Sample

The patients were 56% male (681) with a median age of 4.0 years (interquartile range, 1.8–10.0 years), and 93.9% (1132) were born in Spain. Of them, 82.1% (995) had visited because of illness, and the rest were there because of a traumatic pathology.

Some 16.2% (197) had an underlying chronic disease, and 11.9% (144) had a history of surgery. Of the patients, 76.5% (425) attended school, and 39.8% (468) reported that they participated in at least one extracurricular sports activity.

The mother, father, or both accompanied 82.1% (998) of the patients to the pediatric A&E department, and as regard origin, 85.1% (995) of the parents were Spanish, followed by 8.9% (108) from the American continent. One or both parents of 21.7% (261) of the patients were reported as having some kind of chronic disease.

Pain Prevalence, Intensity, and Characteristics

The number of patients in pain at the time of the interview was 646, which means the prevalence of pain in the sample was 53.1% (95% confidence interval, 50.3%–55.9%).

The intensity and characteristics of the pain are reflected in Table 1.

Associations

Age, attending school, practicing an extracurricular sport, history of surgery, visiting the A&E department due to trauma, and at least 1 of the parents being Spanish were related to a higher prevalence of pain in the univariate analysis (Table 2). However, in the multivariate analysis, this association was demonstrated to be limited to an older age (with an increased odds ratio of 1048 per each year increase in age), school attendance, and the parent(s) being Spanish (Table 3).

As for the intensity of the pain, in the univariate analysis, intense pain was found more frequently in children who did an extracurricular sports activity (45.1% vs 34.9%; $P = 0.010$) and in those whose parents had some kind of chronic disease (50.4% vs 35.9%; $P = 0.006$). By contrast, there were no differences in this degree of pain intensity based on the reason for visit (illness

TABLE 2. Association Between the Presence of Pain and the Demographic Characteristics. Univariate Analysis

	No Pain (n = 571), n (%)	Yes Pain (n = 646), n (%)	No. Responses	Total (n and % Column)	*P*
Age					<0.001
Median (IQR)	3 (1.4–8)	6 (2–10)	1217	4.0 (IQR, 1.8–10.0)	
Sex					0.684
Boy	247 (46.3)	287 (53.8)	1215	534 (44)	
Girl	323 (47.4)	358 (52.6)		681 (56.1)	
Country of birth, grouped according to WHO					0.138
Spain	533 (47.1)	599 (52.9)		1132 (93.9)	
Other	31 (41.9)	43 (58.1)		74 (6.1)	
Europe	8	5	1206	13	
Americas	14	26		40	
Africa	1	0		1	
Southeast Asia	1	1		2	
East Mediterranean	3	10		13	
Pacific	4	1		5	
Chronic disease					0.866
Yes	91 (46.2)	106 (53.8)	1213	197 (16.2)	
No	476 (46.9)	540 (53.2)		1016 (83.8)	
Surgical history					0.006
Yes	52 (36.1)	92 (63.9)	1212	144 (11.9)	
No	515 (48.2)	553 (51.8)		1068 (88.1)	
In school/nursery school					<0.001
Yes	391 (42.3)	534 (57.7)	1209	925 (76.5)	
No	174 (61.3)	110 (38.7)		284 (23.5)	
Extracurricular sports activity					<0.001
Yes	182 (38.9)	286 (61.1)	1176	468 (39.8)	
No	372 (52.5)	337 (47.6)		708 (60.2)	
Reason for visit					0.034
Illness	482 (48.3)	516 (51.7)	1216	998 (82.1)	
Trauma/accident	88 (40.4)	130 (59.6)		218 (17.9)	
Person accompanying patient					0.465
Mother/father/both	545 (54.6)	622 (62.3)	1216	998 (82.1)	
Other	24 (52.2)	22 (47.8)		46 (3.8)	
Parents' country					0.003
Spain	454 (48.3)	541 (57.5)	1160	995 (85.1)	
Other	96 (58.2)	69 (41.8)		165 (14.9)	
Chronic disease in parents					0.673
Neither	446 (47.4)	494 (52.6)	1201	940 (78.3)	
Mother or father/both	120 (46)	141 (54)		261 (21.7)	

The qualitative variables are expressed as absolute number (n) and percentage (%), and the quantitative ones as median and IQR.
IQR indicates interquartile range; WHO, World Health Organization.

[39.1%] vs trauma [35.7%]; $P = 0.768$), on whether the child suffered from a chronic disease (36.5% vs 38.8%, respectively; $P = 0.481$), nor the country where the child's parents were born (Spain [38.4%] vs others [34.9%]; $P = 0.732$).

Whether the parents had a chronic disease did not make a difference in the proportion of them who administered pain relievers at home before going to the accident and emergency department (49.6% vs 51.0%; $P = 0.221$), nor did the existence of a chronic disease in the child (45.3% vs 51.8%; $P = 0.776$).

Agreement

Upon analyzing the interrater agreement, a value of $k = 0.35$ was found between the patient and professionals, $k = 0.38$ between the patient and the parents, and $k = 0.17$ between the parents and professionals. Table 4 shows the agreement in cases where the patients cooperated or did not cooperate and also stratifies agreement according to their reason for visit.

DISCUSSION AND CONCLUSIONS

Pain is a frequent reason for an emergency department visit, whether because of pain itself or because of the illness or injury causing it. Numerous studies have been carried out to evaluate the prevalence of pain in pediatric patients,[7,19–21] but most of these were done in hospitalized patients. Therefore, the real prevalence is unknown, both due to a lack of evaluation and due to it being

TABLE 3. Association Between the Presence of Pain and the Demographic Characteristics. Multivariate Analysis

			95% CI OR	
	P	OR	Lowest	Highest
Age	0.005	1.048	1.014	1.082
Prior surgery (yes/no)	0.126	1.353	0.010	1.994
In school (yes/no)	0.024	1.482	1.053	2.084
Sports activity (yes/no)	0.377	1.136	0.857	1.506
Reason for visit (medical/trauma)	0.980	0.096	0.718	1.381
One or both parents Spanish (yes/no)	0.003	1.680	1.191	2.368

OR indicates odds ratio; 95% CI, 95% confidence interval.

difficult to accurately estimate its presence or absence and intensity in pediatric patients.

Our study is one of the first done across multiple centers, involving 15 pediatric accident and emergency departments. It found a pain prevalence of approximately 50% in patients who visited the emergency department for any reason. In previous studies carried out on the general population, the prevalence ranged between 18.4% in a study in Tarragona including 561 children[22] and 27% in a Canadian study that evaluated the presence of pain in pediatric patients before admission.[23] Nevertheless, there are few studies that evaluate the presence of pediatric pain in the A&E department and during prehospital care. In the study by Galinski et al,[24] a pain prevalence of 37% was found, and in Murphy et al,[25] this figure was 42.4%. However, upon evaluating pain in hospitalized patients, this prevalence climbed to percentages between 84%[20] and 86%,[19] thus highlighting the importance of correctly detecting the presence of pain in hospitalized patients.

It is important to highlight that, in our sample, up to more than half of the patients had moderate-to-severe pain, a finding shared by Galinski et al[24] and Murphy et al,[25] thus underscoring the importance of correctly managing pain in emergency department patient care. Another noteworthy finding was that, in previous studies, only 20% of the patients received pain relievers at home before arriving to the A&E department, despite the high prevalence of pain,[25] whereas, in our study, up to half the patients received treatment for the pain before their arrival.

We found that older patients had statistically significantly more pain than younger ones, even though it is proven that the descending inhibitory pain pathways are less developed in breastfeeding infants, especially newborns.[26] This result must therefore mean that pain is evaluated better in older patients. For example, in prior studies like that of Benini et al,[27] which evaluated the level of pain recorded for patients between 4 and 14 years old with a headache, the univariate and multivariate analyses revealed that pain was evaluated significantly more often in children from 7 to 14 years old than in those from 4 to 6 years old. Similarly, other studies have demonstrated that pain was more inconsistently evaluated in younger.[25]

Also in the multivariate analysis, we detected an association of the prevalence of pain with school attendance and Spanish parents; it has been studied previously that sociodemographic differences may affect the perception of pain and analgesia and could contribute to pain expression and interpratation.[28,29] The association between school attendance and higher prevalence of pain could be in relationship with better expression of pain in children who has skills and vocabulary enough for expressing it; a previous review has concluded that children can express their pain experiences in terms of cause, location, meaning, and quality and that these experiences are influenced by their previous pain experiences, their expectations, and their sociocultural background.[30] Sociocultural background could be the explanation that Spanish children had more pain prevalence, but not because of differences in nociception but of differences in pain assessment, as it has been found previously in a recent study that detected that ethnicity minority is at risk of delay to receiving analgesic medication because of language barriers.[31]

On another note, there is the question of whether the presence of chronic disease or pain in the parents affects how they perceive their children's pain. A recent study[32] did not find that the adolescent children of parents with chronic pain had an increased perception of pain compared with those whose parents did not have pain. We also failed to encounter any association between the presence of chronic disease in the parents and the prevalence of pain in pediatric patients.

Finally, in our study, we analyzed the agreement in the pain level indicated by each evaluator. It showed fair agreement in the pain score given by patients and professionals and between patients and parents, and a poor interrater agreement between professionals and parents.

When we evaluated the agreement only in children who were cooperative, meaning those who could say how much it hurts, we observed that the interrater agreement decreased to "poor" between patient and professional and increased to "moderate" between parents and children, remaining "poor" between professionals and parents.

By definition, pain is a subjective condition, and it should therefore be evaluated as such.[9] Many studies have revealed a lack of agreement in the results of pain evaluations when carried out on children, parents, and health care workers, even when the correct scale was being used.[11] The VAS scale evaluation by parents only showed moderate agreement with the VAS response given by the children, and the scales completed by health care personnel were even less reliable, underestimating pain in children.[33] This reinforces the idea that it should be the patients themselves who express their pain level, using tools adapted to their age. Nonetheless, this makes it especially important to correctly manage the behavioral scales in preverbal patients.

Our study does have some limitations. First, given that the survey was administered only to parents who visited a pediatric A&E department and whose children therefore presented an acute

TABLE 4. Interrater Agreement in the Evaluation of Pain Intensity Between Parents/Professional/Patient

	Overall Agreement	Cooperative Child	Uncooperative Child	R.V. Illness	R.V. Trauma
Patient-professional	0.35	0.18	1	0.30	0.37
Patient-parents	0.38	0.47	0.11	0.43	0.36
Parents-professional	0.17	0.18	0.11	0.11	0.19

The values are expressed as Cohen κ.

R.V., reason for visit.

illness or injury (whether they visited due to pain), the results cannot be extrapolated to the entire population. Second, patients with a significant language barrier were not included, so we could not evaluate the prevalence of pain in patients who did not speak Spanish. In addition, the equivalence between the pain scales has not been validated; also, the Faces Pain Scale—Revised should be used for the pain assessment in schoolchildren,[34,35] but it was not implemented in all the emergency departments that participated in the study.

Lastly, systematic sampling was the method chosen, but a randomized sampling would have conferred greater scientific value.

With this study, we conclude that the presence of pain in patients visiting the A&E department is high, and although evaluating pain in this setting may be complicated because of the work load, it should be routinely recorded. It is important to mention that, in the absence of self-report, parenteral assessment should be used over health care provider assessment, as we tend to underestimate pain.

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